CLAIMS

What is claimed is:

1. A fuel cell stack comprising:

a plurality of membrane electrode assemblies, each membrane electrode assembly comprising an anode fluid distribution layer, a cathode fluid distribution layer, a polymer electrolyte membrane interposed between the anode and cathode fluid distribution layers, an anode electrocatalyst layer interposed between the polymer electrolyte membrane and the anode fluid distribution layer, and a cathode electrocatalyst interposed between the polymer electrolyte membrane and the cathode fluid distribution layer,

wherein the plurality of membrane electrode assemblies are stacked in an alternating manner such that the polarity of adjacent membrane electrode assemblies are opposite, and wherein the plurality of membrane electrode assemblies are externally jumpered.

2. The fuel cell stack of claim 1 further comprising a plurality of electrically insulating spacers interposed between, and configured to allow fluid access to, opposing faces of adjacent membrane electrode assemblies.

3. The fuel cell stack of claim 2 wherein, for each membrane electrode assembly, the anode fluid distribution layer is externally jumpered to the cathode fluid distribution layer in a first of the two adjacent membrane electrode assemblies and the cathode fluid distribution layer is externally jumpered to the anode fluid distribution layer in a second of the two adjacent membrane electrode assemblies.

4. The fuel cell stack of claim 3 wherein, for each membrane electrode assembly, a protruding edge of the anode fluid distribution layer is connected to a protruding edge of the cathode fluid distribution layer in the first adjacent membrane electrode assembly and

a protruding edge of the cathode fluid distribution layer is connected to a protruding edge of the anode fluid distribution layer in the second adjacent membrane electrode assembly.

5. The fuel cell stack of claim 4 wherein the protruding edges of the anode and cathode fluid distribution layers are fluid impermeable.

6. The fuel cell stack of claim 2 wherein the anode and cathode fluid distribution layers of each membrane electrode assembly comprise an electrically conductive material having a high in-plane conductivity.

7. The fuel cell of claim 2 wherein a plurality of electrically conductive elements are disposed within the anode and cathode fluid distribution layers of each membrane electrode assembly to impart a high in-plane conductivity to the anode and cathode fluid distribution layers.

8. The fuel cell stack of claim 7 wherein the electrically conductive elements are selected from metallic wire or mesh, carbon nanotubes and highly oriented pyrolytic graphite or graphite whiskers.

9. The fuel cell stack of claim 1 further comprising:

a plurality of electrically conductive anode flow field plates arranged such that an anode flow field plate is interposed between opposing faces of adjacent membrane electrode assemblies having facing anode fluid distribution layers;

a plurality of electrically conductive cathode flow field plates arranged such that a pair of cathode flow field plates is interposed between opposing faces of adjacent membrane electrode assemblies having facing cathode fluid distribution layers; and

a plurality of electrically insulating coolant flow field plates arranged such that a coolant flow field plate is interposed between each pair of cathode flow field plates

interposed between opposing faces of adjacent membrane electrode assemblies having facing cathode fluid distribution layers,

such that the fuel cell stack comprises a plurality of repeating units, each repeating unit comprising, in the following order, a first cathode flow field plate, a first membrane electrode assembly, an anode flow field plate, a second membrane electrode assembly and a second cathode flow field plate, and each repeating unit being interposed between two coolant flow field plates.

10. The fuel cell stack of claim 9 wherein the anode flow field plate of each repeating unit is externally jumpered to both the first and second cathode flow field plates of an adjacent repeating unit.

11. The fuel cell stack of claim 9 wherein the average resistance of each of the anode and cathode flow field plates is less than about 50 m-ohms.

12. The fuel cell stack of claim 9 wherein the ratio of formed plate width to average formed plate thickness of each of the anode and cathode flow field plates is less than about 250.